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PATENT SPECIFICATION

797,649

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COMPLETE SPECIFICATION

Vibrator Motor

We, SCHICK INCORPORATED, a Corporation of the State of Delaware, having a place of business at Lancaster, State of Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to vibrator electric motors of the type used for imparting a rapid, reciprocating motion to a driven element.

The principal object of the invention is to provide a vibrator motor of that type that is extremely compact is of economical construction and yet is of adequate power to permit it to drive the reciprocating cutter of an electric shaver.

According to one aspect of the invention, in a vibrator motor for imparting reciprocating motion to a driven element and comprising a substantially U-shaped field magnetic core a part of which is encircled by a field coil, an armature magnetic core mounted for pivotal movement relative to the field magnetic core, and a spring acting on the armature, the armature magnetic core is substantially L-shaped and has its vertical leg disposed along the outer side of one leg of the field core and pivoted at its lower end on the field core, the horizontal leg of the armature core extends over the free end of one leg of the field core into proximity with the free end of the other leg of the field core, and the spring, when the motor is not energised, acts to hold the armature in a median position with respect to its stroke.

According to another aspect of the invention, in a vibrator motor for imparting reciprocating motion to a driven element and comprising a substantially U-shape field magnetic core a part of which is encircled by a field coil, an armature magnetic core co-operating with magnetic poles on both legs of the field core, a spring acting on the armature, and drive element, the armature magnetic core is of inverted L-shape, one leg of the field core has its outer side sloped in a direction such that the leg tapers in a narrowing sense towards its free end and the sloped side of the leg provides an extended pole face, the vertical leg of the armature core is disposed alongside the sloped side of the field core leg and pivoted at its lower end on the field core, the side of the armature core leg adjacent the sloped side of the field core leg is sloped substantially complementary thereto, and the spring acts to oppose movement of the said armature core leg towards the sloped outer side of the field core leg.

The invention will be readily understood from the following description and accompanying drawings of a preferred form in which the various features are combined to provide a highly efficient motor.

In the drawings;

Fig. 1 is a perspective view of the assembled motor.

Fig. 2 is an enlarged, front elevational view partially broken out and with the coil sectioned, of the motor shown in Fig. 1:

Fig. 3 is a similarly enlarged side elevation;

Fig. 4 is a similarly enlarged top plan view;

Fig. 5 is an exploded view of the components of the motor.

Figs. 6 and 7 are diagrams illustrating the lines of force patterns in the field and armature cores.

As illustrated, the vibrator motor includes a field magnetic core 1, preferably of laminated construction, of substantially U-shape, that is, with upwardly extending spaced legs 2, 3. (For convenience throughout, the various components will be described and claimed with reference to the position in

[Price 3/6]

which the motor is shown in the drawings, but it will be understood that the motor can be used with the legs 2, 3 extending in any direction.)

Associated with the field is an armature magnetic core 10 which is of inverted L-shape, or substantially L-shape, the vertical leg 11 of the armature being disposed along the outer side of leg 3, that is, the side of it remote from leg 2. The horizontal or upper portion 12 of the armature core extends over the free or upper end of leg 3 of the field core into proximity with the free or upper end of field leg 2.

The lower end of the armature core is pivoted on the field core by a knife-edge type of pivot the field core having an offset shoulder 13 at the lower end of leg 3 and a notch 14 in the upper surface of the shoulder to receive a knife-edge 15 on the lower end of the armature core.

A field coil 20 encircles a portion of the field core, such as leg 3 and, in this particular arrangement, encircles also the leg 11 of the armature core 10. As shown, the coil is seated on a second offset shoulder 21 at the lower end of the field core and is located laterally by engagement with a vertical face 22 on the field core 10 between the shoulders 13 and 21 and the inner vertical face 23 of leg 3. As will be noted this arrangement makes for an extremely compact structure which is also rugged and convenient to handle in that the armature is largely enclosed.

Spring means are provided which are biassed to oppose movement of the armature core leg 11 toward the adjacent or outer face of leg 3 and in the illustrated construction a single spring 30 serves the dual purpose of holding the armature core leg 11 engaged with the pivot notch 14 and also controlling its vibration. As will be understood, the spring normally (that is, when the motor is at rest) holds the armature in a median position with respect to its stroke (see Figs. 2 and 7) and the resistance it offers to the reciprocating movement of the armature is such as to prevent contact between the armature core and field core. No make-and-break mechanism is provided, it being assumed that the motor will be operated by alternating current. Drive means are provided, such as the projection or actuator 31 extending upwardly from the top of the armature core, for connection to a driven element, such as the inner cutter of an electric shaver. Alternatively the actuator may be formed as an extension of an armature core lamination.

It will be seen that the upper end of field core leg 2, on its inner side, is formed with a recess 32 and that the tip 33 of the armature core is of a shape complementary to that of the recess. Also, the side of leg 3 of the field core tapers toward its free end, its outer face being of more or less arcuate form, and the side of the armature core leg tapers in the opposite direction, that is, toward its pivot, its side face adjacent the field core being substantially complementary to the outer face of leg 3. The air gap between them also tapers in a narrowing sense toward its lower end, that is, when the armature core is in its idle or median position.

The described arrangement makes feasible the assembly of the components in a complete motor requiring only to be inserted into and secured to the case or housing of the shaver or other implement to be driven.

As shown, the field core has a heavier side plate or bracket 40 riveted to it and this bracket is conveniently utilized for anchoring to the field core both the armature spring 30 and the field coil 20. For the latter purpose, the bracket is formed with a deformable finger 41 which, after the coil has been seated as above described, is bent into the position indicated in the drawings to engage the top of the coil and hold it against withdrawal. The other end of the bracket 40 provides an upstanding lug 42 to which the lower end of spring 30 is riveted. The upper end of the spring is seated in a notch 43 in the top of the armature core.

The complete motor can thus be assembled, adjusted and tested and then inserted in its case. As will be recognized, the actuator 31 is designed, in this instance, to enter a hole or recess such as is commonly provided in the inner cutter of an electric shaver. The motor, as usual, may be secured in position in its case in any conventional or preferred manner.

Figs. 7 and 6 illustrate the approximate lines of force patterns produced, respectively, at the mid-point and at the end point of the armature stroke in its movement toward leg 2 of the field. As will be noted, the field core has a pole at the free or upper end of leg 2 and a second, elongated pole extending from adjacent the base of the armature core leg 11 to the free or upper end of leg 3. Similarly, the armature core has a pole adjacent its free end and a second, elongated pole extending along its arcuate face. Thus, the arrangement results in the creation of two pairs of opposite pole faces or two zones of magnetic attraction, rather than the usual single zone; and, the motor is of surprising power for its size.

What we claim is:—

1. A vibrator motor for imparting reciprocating motion to a driven element, comprising a substantially U-shaped field magnetic core a part of which is encircled by a field coil, an armature magnetic core mounted for pivotal movement relative to the field magnetic core, and a spring acting on the armature, wherein the armature magnetic core is

substantially L-shaped and has its vertical leg disposed along the outer side of one leg of the field core and pivoted at its lower end on the field core, the horizontal leg of the armature core extends over the free end of one leg of the field core into proximity with the free end of the other leg of the field core, and the spring, when the motor is not energised, acts to hold the armature in a median position with respect to its stroke.

2. A vibrator motor for imparting reciprocating motion to a driven element, comprising a substantially U-shaped field magnetic core a part of which is encircled by a field coil, an armature magnetic core co-operating with magnetic poles on both legs of the field core, a spring acting on the armature, and drive means carried by the armature for connection to the driven element, wherein the armature magnetic core is of inverted L-shape, one leg of the field core has its outer side sloped in a direction such that the leg tapers in a narrowing sense towards its free end and the sloped side of the leg provides an extended pole face, the vertical leg of the armature core is disposed alongside the sloped side of the field core leg and pivoted at its lower end on the field core, the side of the armature core leg adjacent the sloped side of the field core leg is sloped substantially complementary thereto, and the spring acts to oppose movement of the said armature core leg towards the sloped outer side of the field core leg.

3. A vibrator motor according to Claim 1, wherein the armature core carries drive means for connection to the driven element.

4. A vibrator motor according to any preceding claim, wherein the field coil encircles the leg of the field core alongside which the armature core leg is disposed, and also encircles the said armature core leg.

5. A vibrator motor according to any preceding claim, wherein, when the motor is at rest the spring holds the armature core in an idle position in which the air gap between the vertical leg of the armature core and the adjacent field core leg tapers in a narrowing sense towards the lower end of the said armature core leg.

6. A vibrator motor according to any preceding claim, wherein the vertical leg of the armature core and the leg of the field core alongside which it extends have their adjacent faces of arcuate shape.

7. A vibrator motor according to any preceding claim, wherein the spring has one end engaged with the armature core and the other end fixed in relation to the field core.

8. A vibrator motor according to any preceding claim wherein the field core is formed with a lateral shoulder adjacent its lower end and the field coil is seated on the said shoulder.

9. A vibrator motor according to any preceding claim, wherein the field coil encircles a leg of the field core and is secured against removal therefrom by means carried by the field core.

10. A vibrator motor according to claim 9, wherein a side plate secured to the field core carries the means for securing the coil against removal, and the end of the spring which is fixed in relation to the field core is secured at one end to the said side plate.

11. A vibrator motor according to Claim 10, wherein the end of the spring which is secured to the plate is secured to a leg on the plate lug being disposed at one side of the field core.

12. A vibrator motor substantially as described with reference to, and as shown in, the accompanying drawings.

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Fig.1.

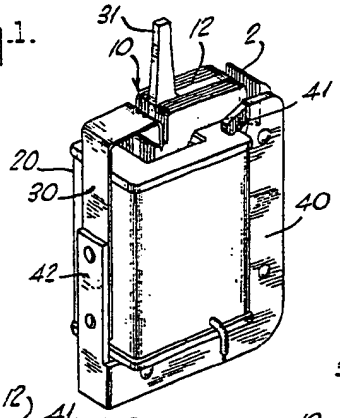


Fig.2.

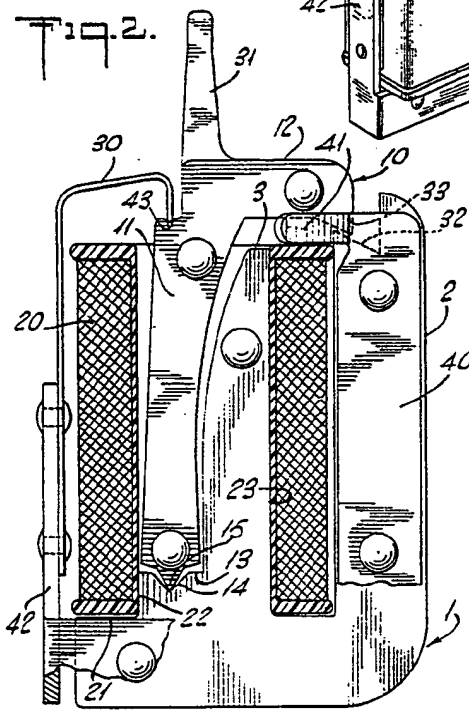
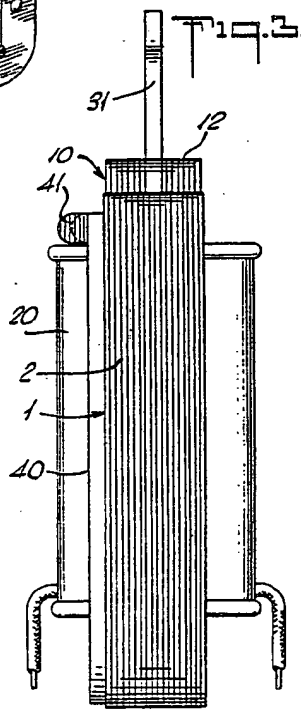


Fig.3.



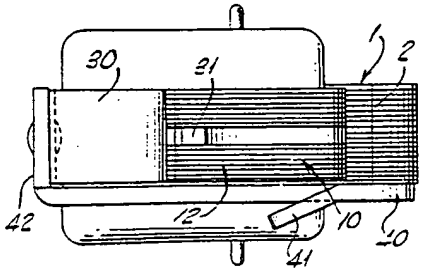


Fig.4.

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Sheets 1 & 2

Fig.5.

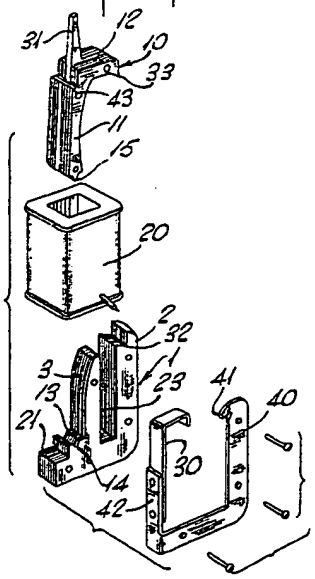


Fig.6.

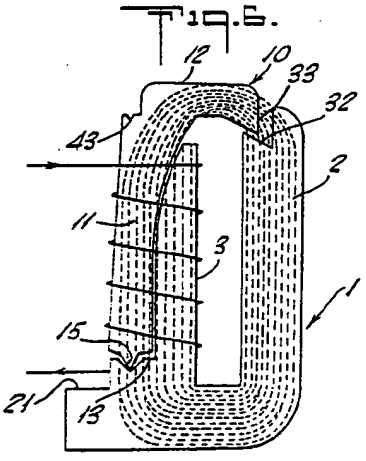
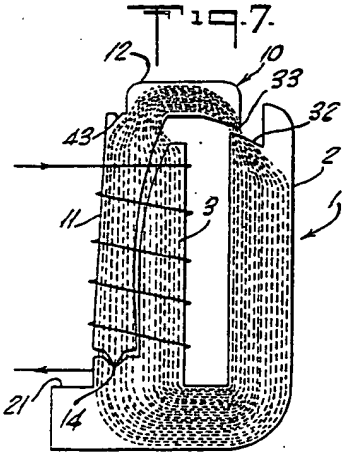


Fig.7.



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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

Fig.1.

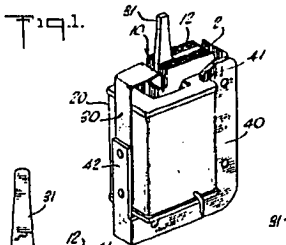

Fig.2.

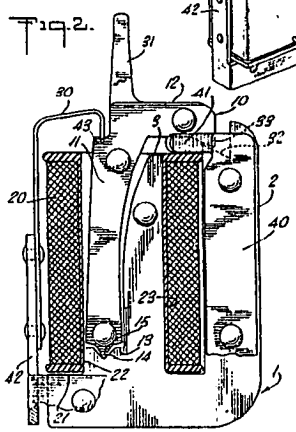

Fig.3.

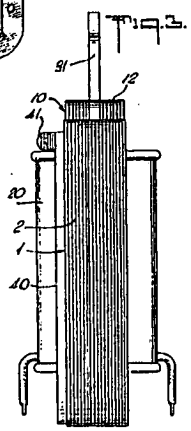

Fig.4.

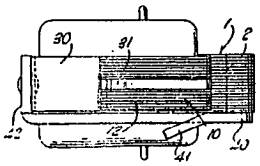

Fig.5.

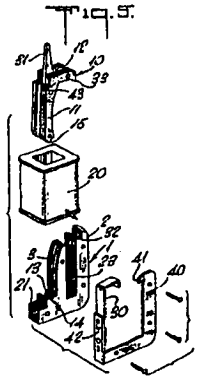

Fig.6.

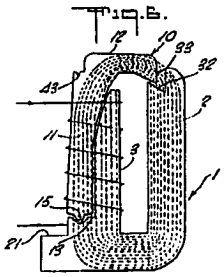

Fig.7.